

MAN AND ENVIRONMENT IN NORTHEAST INDIA: AN ECOLOGICAL PERSPECTIVE

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Northeast India may be considered to be an archetypal region for understanding man and his relationship to the environment in a systemic context. As development and change in this region is recorded at a slow pace, this region provides a solid case study for ethnographical analogy in order to understand ecological adaptation. Traditional rural cultures have a fundamentally different approach towards their biotope from that of modern affluent urban societies. Traditional societies value their natural surroundings as a life supporting resource. Moreover, in many cases, they develop and maintain certain indigenous rules and regulations for sustainable development in the form of customary laws, religious sentiment or social taboo. This paper is an attempt for understanding the settlement and subsistence behaviour of the indigenous populations of Northeast India based on the rich natural resources available for their livelihood with a strong bonding with their surrounding environment.

Introduction

Northeast India is spread across over 262,000 km² and comprises the eight Indian states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. This vast region is known for its diverse landscapes and ecologies as well as its ethnolinguistic and cultural diversity. These states are collectively referred to as 'the Northeast', 'Northeast India' or 'the Northeastern Region'. Therefore, Northeast India is used here as a term to denote the region not merely as a geographical entity, but also as a complex cultural interaction sphere.

Northeast India is an ethnic mosaic consisting of different tribal groups of various ethnic stocks, speaking diverse languages, maintaining their traditional customs and practices, having self-sufficient economies, and thus creating a multicultural constellation of tribes and peoples. Two main linguistic phyla can be found among the present-day tribal populations of Northeast India, viz. Austroasiatic and Tibeto-Burman. The languages and dialects of the Khasian branch represent the only subgroup belonging to the Austroasiatic language family in this region, whereas the Tibeto-Burman a.k.a. Trans-Himalayan family is widespread and represented by various tribes belonging to distinct branches or subgroups of this language family, such as Adi, Apatani, Bodo, Chutia, Deuri, Dimasa, Garo, Hajong, Kuki, Lalung, Maran, Mech, Mishng, Monpa, Naga, Nyishi, Rabha, Kokborok, and so forth (van Driem 2001, 2014). A third and fourth linguistic phylum found in Northeast India are the Kradai and Indo-European language families.

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This region harbours more than 130 major tribal communities out of the total of 427 tribal communities found in India (Census of India, 2001). Except for a few tribal communities such as the Mikir a.k.a. Karbi and many of the Bodo-Koch language communities, most of tribal communities inhabit the hills. Some tribes are small, whilst others are numerically strong. The distribution pattern of the tribal populations shows that some tribes are widely spread out, whilst others are concentrated in relatively small territories (Taher 1977: 16-26). Tribal groups maintain contact and communication with their respective neighbouring populations. Myths and legends as well as the history of various communities indicate inter-group contacts and culture exchange (Roy Burman 1974: 303-7). Although the tribal populations show great diversity, we see certain similarities in their cultural practices, economy, subsistence patterns and ecological adaptations (Fig. 1). The shared cultural background of Northeast Indian tribes must be considered in order to understand the relationship of man to his environment.



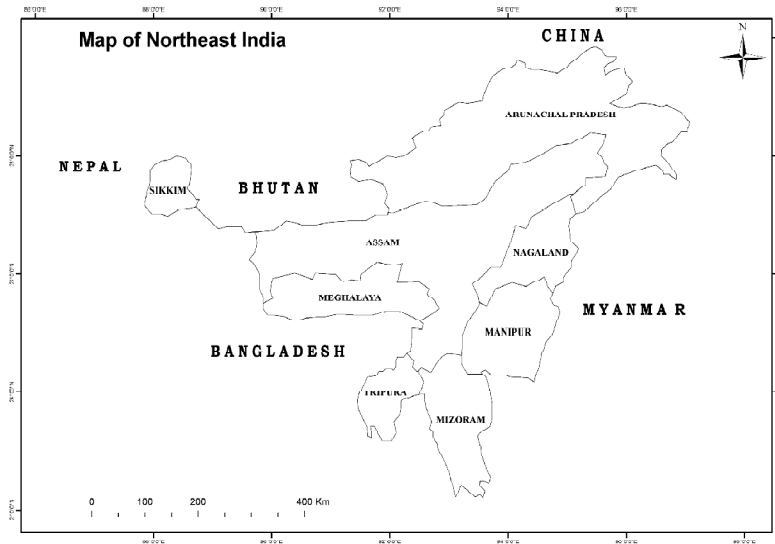
Figure 1: A Glimpse of Simple day-to-day Lifestyle

The so-called ‘scheduled tribe’ status is generally applied to ethnolinguistic populations indigenous to the Indian subcontinent who fall outside of the prevailing Indian social structure or caste system. In the 1991 Census, scheduled tribes accounted for 67.76 million people, representing 8.08 percent of India’s population. Scheduled tribes are spread across the country mainly in forest and hilly regions. A table prepared on the basis of the data gathered by the Ministry of Tribal Affairs of the Government of India showed the enormous ethnic diversity observable in

Northeast India (Table 1). Many of the tribal groups have their counterparts across the international boundary in Tibet, Yúnnán province of China, Thailand, Laos, Cambodia, Burma and the Chittagong hill tracts of Bangladesh (Aier and Changkija 2003: 332-380).

TABLE 1: MAJOR TRIBAL GROUPS RESIDING IN NORTHEAST INDIAN STATES
(SOURCE: MINISTRY OF TRIBAL AFFAIRS, GOVT. OF INDIA)

<i>State</i>	<i>Tribal groups</i>
Arunachal Pradesh	Abor, Adi, Aka, Apatani, Dafla, Galong, Hrusso, Idu, Khamba, Khampti, Khowa, Mishmi, Momba, Naga, Sherdukpen, Singpho, Tagin, Taroan, etc.
Assam	Chakma, Dimasa, Kachari, Garo, Hajong, Hmar, Khasi, Jaintia, Synteng, Pnar, War, Bhoi, Lyngngam, Kuki (including Biatc, Changsan, Chongloi, DOUNGEL, Gamalhou, Gangte, Guite, Hanneng, Haokip, Haupt, Haolai, Hengna, Hongsung, Hrangkhwal, Rangkhoh, Jongbe, Khawchung, Khawathlang, Khothalong, Khelma, Kholhou, Kipgen, Lengtang, Lhoujem, Lhouvun, Lupheng, Mangiel, Misao, Riag, Sairhem, Selnam, Singson, Sitlhou, Sukte, Thado, Thangngeu, Uibuh, Vaiphei), Lakher, Man (Tai Speaking), Mizo (Lushai), Mikir (Karbi), Naga, Pawi, Syntheng, Lalung, Barmans, Borokachari, Deori, Hajai, Kachari, Sonwal, Lalung, Mech, Miri, Rabha, Dimasa, Hajong, Singhpho, Khampti, Garo etc.
Manipur	Aimol, Anal, Angami, Chiru, Chothe, Gangte, Hmar, Kabui, Kacha naga, Koirao, Koireng, Kom, Lamgang, Mao, Maram, Maring, Mizo (Lushai), Monsang, Moyon, Paite, Puum, Ralte, Sema, Simte, Suhte, Tangkhul, Thadou, Vaiphui, Zou, Poumai Naga, Taroa, Kharam, Kuki etc.
Meghalaya	Chakma, Dimasa, Kachari, Garo, Hajong, Hmar, Khasi, Jaintia, Synteng, Pnar, War, Bhoi, Lyngngam, Kuki (including Biате, Changsan, Chongloi, DOUNGEL, Gamalhou, Gangte, Guite, Hanneng, Haokip, Haupt, Haolai, Hengna, Hongsungh, Hrangkhwal, Rangkhoh, Jongbe, Khawchung, Khawathlang, Khothalong, Khelma, Khoohou, Kipgen, Lengthang, Lhangum, Lhoujem, Lhouvun, Lupheng, Mangiel, Misao, Riag, Sairhem, Selnam, Singson, Sitlhou, Sukte, Thado, Thangngcu, Uibuh, Vaiphei), Lakher, Man (Tai Speaking), Mizo (Lushai), Mikir (Karbi), Naga, Pawi, Synteng, Boro Kacharis, Koch, Raba etc.
Mizoram	Chakma, Dimasa, Kachari, Garo, Hajong, Hmar, Khasi, Jaintia, Synteng, Pnar, War, Bhoi, Lyngngam, Kuki (including Baite, Changsan, Chonloi, DOUNGEL, Gamalhu, Gangte, Guite, Hanneng, Haokip, Haolai, Hengna, Hongsungh, Hrangkhwal, Rangkhoh, Jongbe, Knawchung, Knawathlang or Khothalong, Khelma, Kholhou, Kipgen, Lenthang, Lhangum, Lhoujem, Lhouvun, Lupheng, Mangjel, Missao, Riag, Siarhem, Selnam, Singson, Sitlhou, Sukte, Thado, Thangneu, Uibuh, Vaiphei), Lakher, Man (Tai-speaking), Mizo (Lushai), Mikir, Naga, Pawi, Synteng, Paite etc.
Nagaland	Naga, Kuki, Kachari, Mikir, Garo etc.
Sikkim	Bhutia (including Chumbipa, Dophapa, Dukpa, Kagatcy, Sherpa, Tibetan, Tromopa, Yolmo), Lapeha, Limboo, Tamang etc.
Tripura	Bhil, Bhutia, Chaimal, Chakma, Garoo, Halam, Jamatia, Khasia, Kuki (including Baite, Belalhut, Chhalya, Fun, Hajango, Jangtei, Khareng, Khephong, Kuntei, Laifang, Lentei, Mizel, Namte, Paitu, Rangchan, Rangkhoh, Thangluya), Lepcha, Lushai, Mag, Munda, Kaur, Noatia, Orang, Raing, Santal, Tripuri, Uchai etc.



Map 1: Map of the Eight States of Northeast India (Source: Census of India 2001 Administrative Atlas)

The region has been called a 'living museum of man' because of the ethno-linguistic diversity, with different groups adopting of different socio-economic strategies and cultural lifestyles and professing divergent indigenous or imported religious belief systems (Roy 1991: 73). Now, let us turn into the rich natural resources available and exploited by different groups living in the region. It will provide an ecological perspective of the socio-economic-cultural lifestyles of these indigenous groups.

Floral and Faunal Resources

Northeast India is a treasure trove of huge forests, natural products and numerous species of mammals, birds, reptiles and amphibians. The recurrent news about the discovery of a new plant or animal species, previously unknown to science, strongly underscores the urgency of scientific investigations in this hidden and much neglected part of the world. India's northeast along with the eastern Himalayan region forms a distinctive transitional zone between the Indian, the Indo-Malayan and the Indo-Chinese bio-geographical realms. Northeast India is also the meeting point of the Himalayan region with peninsular India (Takhtajan 1969). The region has unique physiographic landscapes characterised by hills, plateaus and flood plains. The area comprises a significant proportion of the Himalayan and Indo-Burmese biodiversity hotspots (Mittermeier *et al.* 2004). On the basis of the distribution of the flora and fauna, biological affinities can be observed with Southeast Asia (Mani 1974). Table 2 presents the area, climatic conditions and plant species richness in Northeast India.

TABLE 2: AREA, CLIMATIC CONDITIONS AND THE RICHNESS OF PLANT SPECIES IN NORTHEAST INDIA (CHAKRABORTYA *ET AL.* 2012: 148)

<i>States</i>	<i>Total area (sq km)</i>	<i>Forest covers (%)</i>	<i>Climatic condition</i>	<i>Plant diversity specification</i>
Arunachal Pradesh	83,743	80.43%	Annual rain fall: 1500-3750 mm Temperature: 0 to 31°C	Flowering plants around 5000 species, but 238 are endemic to the state. The state is rich in 500 species of orchids
Assam	78,438	35.30%	Annual rain fall: 2000-8000 mm Temperature: 5 to 32°C	Flowering plants around 3010 species, from which 102 species are endemic. State is rich in diverse varieties of bamboo (42 species)
Manipur	22,327	77.4%	Annual rain fall: 1250-2700 mm Temperature: 14.5 to 38°C	Flowering plants around 2500 species
Meghalaya	22,429	77.23%	Annual rain fall: 4000-11,436 mm Temperature: 2 to 33°C	Flowering plants around 3500 species
Mizoram	21,081	91.27%	Annual rain fall: 2160-3500 mm Temperature: 11 to 29°C	Flowering plants around 2200 species
Nagaland	16,579	81.21%	Annual rain fall: 2000 mm Temperature: 4 to 30°C	Flowering plants around 2250 species
Sikkim	7,096	82.31%	Annual rain fall: 2700-3200 mm Temperature: 0 to 28°C	Flowering plants around 4500 species
Tripura	10,491	76.95%	Annual rain fall: 2250-2500 mm Temperature: 4 to 38°C	Flowering plants around 1600 species, of which 14% found are endemic

TABLE 3: STATE-WISE FOREST COVER IN NORTHEAST INDIA (SOURCE: FOREST SURVEY OF INDIA 2003)

<i>States</i>	<i>Geographical Area</i>	<i>Forest cover in 2003 (Total)</i>	<i>% of Forest Cover</i>
Arunachal Pradesh	83,743	68,019	81.22
Assam	78,438	27,826	24.04
Manipur	22327	17,219	77.12
Meghalaya	22,429	16,839	75.08
Mizoram	21,081	18,430	87.42
Nagaland	16,579	13,609	82.09
Sikkim	7,096	3,262	45.97
Tripura	10,486	8,093	77.18

Out of the total area falling within the territory of Northeast India, more than 60 percent of the geographical area is under forest cover (Table 3). In view of the identification and protection of representative wild habitats across all the ecosystems in India, including the forests, the Government of India has created a network of 668 Protected Areas comprising 102 National Parks, 515 Wildlife Sanctuaries, 47 Conservation Reserves and 4 Community Reserves. Five of the Protected Areas have been declared by the UNESCO to be World Heritage Sites (Fig. 2). Most of the people residing in and around these protected areas exploit the wildlife for satiating their needs for sustenance and shelter. Below two tables list the protected areas specifying the sizes of the areas covered (Table 4 & 5).

TABLE 4: STATE-WISE DETAILS OF THE PROTECTED AREA NETWORK OF NORTHEAST INDIA (SOURCE: MINISTRY OF ENVIRONMENT AND FORESTS, GOVT. OF INDIA)

<i>State</i>	<i>National Parks</i>	<i>Wildlife Sanctuaries</i>	<i>Conservation Reserves</i>	<i>Community Reserves</i>
Arunachal Pradesh	2	11	0	0
Assam	5	18	0	0
Manipur	1	1	0	0
Meghalaya	2	3	0	0
Mizoram	2	8	0	0
Nagaland	1	3	0	0
Sikkim	1	7	0	0
Tripura	2	4	0	0



Figure 2: One horned rhinoceros, buffalo and birds at the World Heritage Site of Kaziranga National Park

TABLE 5: STATE-WISE DISTRIBUTION OF PROTECTED AREAS IN NORTHEAST INDIA (AS ON 01.09.2011) (SOURCE: MINISTRY OF ENVIRONMENT AND FORESTS, GOVT. OF INDIA)

<i>No. State</i>	<i>Protected Area Network</i>	<i>Names</i>	<i>Areas (in km²)</i>			
1	Arunachal Pradesh	National Parks	Mouling	483		
			Namdapha	1,807.82		
	Wildlife Sanctuaries	D'Ering Memorial (Lali)	190			
		Dibang	4,149.00			
		Eaglenest	217			
		Itanagar	140.3			
		Kamlang	783			
		Kane	31			
		Mehao	281.5			
		Pakhui/ Pakke	861.95			
		Sessa Orchid	100			
		Tale Valley	337			
		Yordi-Rabe Supse	397			
		2	Assam	National Parks	Dibru-Saikhowa	340
	Kaziranga			858.98		
Wildlife Sanctuaries	Manas		500			
	Nameri		200			
	Rajiv Gandhi Orang		78.81			
	Amchang		78.64			
	Barail		326.25			
	Barnadi		26.22			
	Bherjan-Borajan-Padumoni		7.22			
	Burachapori		44.06			
	Chakrashila		45.56			
	Dihing Patkai		111.19			
	East Karbi Anglong		221.81			
	Garampani		6.05			
3	Manipur	Hollongapar Gibbon	20.98			
		North Karbi Anglong	96			
	Wildlife Sanctuaries	Lawkhowa	70.14			
		Marat Longri	451			
		Nambor	37			
		Nambor Doigrung	97.15			
		Porbitora	38.81			
		Pani-Dihing Bird	33.93			
		Sonai Rupai	220			
		National Parks	Keibul-Lamjao	40		
			Wildlife Sanctuaries	Yangoupokpi-Lokchao	184.4	
		4	Meghalaya	National Parks	Balphakram	220
					Nokrek Ridge	47.48
			Wildlife Sanctuaries	Baghmara Pitcher Plant	0.02	
Nongkhylliem	29					
Siju	5.18					

contd. table 5

No.	State	Protected Area Network	Names	Areas (in km ²)
5	Mizoram	National Parks	Murlen	100
			Phawngpui	50
		Wildlife Sanctuaries	Dampa	500
			Khawnglung	35
			Lengteng	60
			Ngengpui	110
			Pualreng	50
			Tawi	35.75
			Thorangtlang	50
			Tokalo	250
			Intanki	202.02
6	Nagaland	National Parks	Fakim	6.4
			Puliebadze	9.23
		Wildlife Sanctuaries	Rangapahar	4.7
			Khongchendzonga	1,784.00
7	Sikkim	National Parks	Barsey Rhododendron	104
			Fambong Lho	51.76
		Wildlife Sanctuaries	Kitam	6
			Kyongnosla Alpine	31
			Maenam	35.34
			Pangolakha	128
			Shingba (Rhododendron)	43
			Clouded Leopard	5.08
8	Tripura	National Parks	Rajbari	31.63
			Gumti	389.54
		Wildlife Sanctuaries	Rowa	0.86
			Sepahijala	13.45
			Trishna	163.08

Root, Tuber and Fruit as Food Resources

The above-mentioned forest areas are the repositories of a large amount of natural food resources. A great variety of edible vegetables such as pumpkin, bottle gourd, ridge gourd, bitter melon, brinjal, chillies, capsicum and cucumber grow in profusion in this region and are cultivated by the inhabitants. Some of the leguminous vegetables available in this region include *Dolichos*, *Vigna*, *Psophocarpus*, *Vigna vexillata* and *Phaseolus vulgaris* (French bean). Moreover, there exists an array of yam species and a variety of spice crops such as black pepper, cumin, true cardamom, saffron, ginger, turmeric and black cardamom.

The indigenous populations living in the hilly terrain grow a variety of vegetables, often endemic to the region, which contribute considerably to their diets. A sizable amount of *Solanum* species are found, for example *Solanum gilo*, *Solanum macrocarpon*, *Solanum khasianum*, *Solanum torvum*, *Solanum mimosum*, *Solanum insanum* and *Solanum kurzii*. It is interesting to note that the king chilli, also known as *Bhut* (Ghost) *Jholakia* in Assam is considered as one of the hottest

chillies in the world. The cucurbitaceous vegetables include *Cucurbita*, *Momordica*, *Luffa* and *Cucumis hardwickii*, the likely progenitor of cultivated cucumber, found growing in natural habitats in the foothills of the region. The cucurbits occurring in domestic, semi-domestic and wild varieties form part of the regular vegetable requirements for many of the communities, as these are highly nutritious. Some of these species are resilient and adaptive so that they can be grown on the land and do not require much care and effort for farming. Moreover some species can be stored for years together and so be used during times of crisis (Yadav *et al.* 2005: 18-28). There are plenty indigenous leafy vegetables such as *Jilmil sag* (*Chenopodium album*) and *Kolmou sag* (*Ipomea reptans*) and tubers such as *Dioscorea alata*, *D. bulbifera*, *D. brevipetiolata*, *D. esculenta*, *D. hamiltonii*, *D. hispida*, *D. kamaonensis*, *D. nummularia*, *D. pentaphylla*, *D. puber* and *D. quinata*, which are all consumed by the local inhabitants (Yadav *et al.* 2009).

Northeast India is a repository for a sizable number of root, tuber and fruit crops. In the forest as well as lowland areas a variety of fruits are found in abundance like banana, pineapple, citrus, papaya, guava, litchi and jackfruit. Of course, numerous cultigens that are widespread today are not indigenous in Asia at all, let alone Northeast India, such as the papaya, pineapple and the chilli. Northeast India boasts tropical and subtropical fruits belonging to the genera *Artocarpous*, *Phyllanthus*, *Anona*, *Averrhoa*, *Persia*, *Aegle*, *Carrisa*, *Passiflora* and *Psidium* and temperate fruits belonging to the genera *Malus*, *Pyrus*, *Prunus*, *Rubus* and *Ribes*, found in a wild state (Yadav *et al.* 2003: 13-28).

Herpetological Resource

Northeast India, an area of uneven topography, ample hills, plains and rivers is a treasure house of diverse flora and fauna. The forest areas are characterised by diverse vegetation, hilly terrain, high rainfall and abundant water sources which furnish ideal habitats for wildlife. This region also acts as the gateway for species of Chinese and Burmese origin as well as Southeast Asian varieties. Consequently, Northeast India shows a greater faunal affinity with Burma and Southeast Asia than with the Indian peninsula. The area has diverse amphibians and reptiles, collectively known as its herpetofaunal complex.

A biological survey of Northeast India indicates a total of about 130 species of amphibians and 169 species of reptiles. The reptiles in the region include one species of crocodilian, 21 species of turtles, 45 species of lizards and 102 species of snakes. Just in the at the Barail hill range alone, a total of 64 species of herpetofauna have been recorded, comprising 43 species of reptiles and 23 species of amphibians. Among the reptiles, 24 species are snakes, 17 species are lizards and 3 species are turtles (Das 2008).

Some of the herpetofaunal species such as pythons, rat snakes and monitor lizards, large sized frogs, turtles and tortoises are exploited by the local inhabitants

for consumption. The legs of amphibians are considered to be a delicacy by the local inhabitants (Das and Sengupta 2010: 2-8). King cobra (*Ophiophagus hannah*) meat is consumed by local people in many parts of Arunachal Pradesh and Nagaland (Das 2008: 4).

The indigenous population consumes turtle (*Pangshura sylhetensis*) meat and eggs which are believed to act as a remedy for gout and arthritis, whilst the carapace of the Assam roofed turtle and other turtle species are also used as medicine for other ailments including asthma. Besides there exists a belief that hanging a carapace in a cattle shed brings good luck and keeps snakes and burglars away from the premises (Baruah *et al.* 2010: 44-45).

Aquatic Resource

Northeast India is known for its hot and humid climate with heavy rainfall that supplies perennial water to the small and big rivers. Moreover, bodies of water such as flood plains, wetlands, lakes and ponds are also abundant in a greatly varied landscape. The ichthyofauna or fish are found in abundance in the diverse water systems represented by rivers, *beels* (i.e. lakes of riverine and tectonic origin), ponds, swamps, marshes and agricultural fields. This region has approximately 267 species of fish belonging to 114 genera under 38 families and 10 orders (Sen 2000), which constitute 33.13% of the total of approximately 806 freshwater fish species found in India (Talwar and Jhingran 1991). The lake Sone, one of the biggest freshwater lakes in Assam, was recorded to host 69 species of fishes belonging to 49 genera under 24 families and 11 orders (Kar *et al.* 2006: 2310). A survey of the ichthyofauna in the Charju river in Arunachal Pradesh recorded a total of 37 species of fishes belonging to 3 orders under 12 families and 22 genera, out of which the Cyprinids were the most dominant group, represented by 16 species belonging to 8 genera, followed by the Balitoridae with 5 species, the Amblycipitidae and Sisoridae, with 3 species each, and the Cobitidae and Psilorhynchidae, with 2 species each, and 1 species each of the families Bagridae, Siluridae, Nandidae, Chandidae, Ambassidae and Channidae (Tesia and Bordoloi 2012: 82). Another study conducted in the major rivers of Mizoram and Tripura and the Barak drainage of southern Assam and Manipur revealed a range of fish diversity. In Mizoram 42 fish species were recorded in the Tuirial, 42 species in the Kolodyne, 31 species in the Karnafuli, 25 species in the Mat, 36 species in the Tlawng, nine species in the Tuirini, 14 species in the Serlui and 23 species in the Tuivai. In Tripura, 28 fish species were recorded in the Manu, 22 species in the Khowai, 53 species in the Gomati, and 22 species in the Feni. In the Barak drainage, the Barak comprised 65 species, the Jatinga 61 species, the Sonai 54 species and the Dhaleswari 32 species (Kar and Sen 2007: 2599). The range of aquatic fauna available for exploitation is great.

The omnivorous character of the indigenous peoples of Northeast India provides another clue to their adaptation to their surrounding environment. Most of the

indigenous people are non-vegetarian by nature, and fish constitutes a large part of their diet. By using nets made of bamboo, cane and other similar materials as well as hooks made of iron and traps made of bamboo, the fishermen collect sizable catches of fish. These traps are made in different shapes and sizes based on the nature of the bodies of water and the movement of the fish (Fig. 3).



Figure 3: Traditional Fishing Activities in Different Water Sources by Local Inhabitants of Northeast India

One interesting aspect of the fishing activities of the tribal peoples is the use of several wild plants containing natural toxins as fish poison in order to easily gather the fish that float to the surface. Tag *et al.* (2005) recorded several plants used by the Hill Miri tribe of Arunachal Pradesh for poisoning fish. They also use several traps and implements in fishing, made from locally available bamboo and other perishable material. Many of these tribal groups also harvest fish, crabs and prawns by modern methods such as bombs and electric generators. In the context of adaptation to local biota, it is pertinent to mention the case of Loktak lake in Manipur, where huts are built on floating *phumdi* vegetation in order to exploit the wetlands for fishing.

Ornithological Resources

The International Council for Bird Preservation (ICBP) considers Northeast India as the repository of the highest bird diversity in the Orient, with about 836 of the

ca. 1,200 bird species recorded for the Indian subcontinent. The eastern Himalayas and the Assam plains are recognised as Endemic Bird Areas (Birand and Pawar 2004: 15). Nameri National Park, located in the foothills of the eastern Himalayas in Assam, harbours a total of 374 species recorded so far, including several endangered species such as the white-winged duck (*Cairina scutulata*), the rufous-necked hornbill (*Aceros nipalensis*), Pallas's fish eagle (*Haliaeetus leucoryphus*), the white-rumped vulture (*Gyps bengalensis*), the slender-billed vulture (*Gyps tenuirostris*), the greater spotted eagle (*Aquila clanga*), the lesser adjutant (*Leptoptilos dubius*), Jerdon's babbler (*Chrysomma altirostre*), the white-cheeked partridge (*Arborophila atrogularis*), the black-bellied tern (*Sterna acuticauda*), the white-tailed eagle (*Haliaeetus albicilla*), the lesser fish eagle (*Ichthyophaga humilis*) and the red-headed vulture (*Sarcogyps calvus*) (Barua and Sharma 2005: 15).

Wild Plant and Animals: Sources of Subsistence and Medicine

The importance of the ecology for an understanding of human culture has been recognised as an essential part of anthropological research. A close association with local ecologies and environments and a dependence on nature play a major role in shaping tribal culture. These population groups basically depend on the environment for their habitation and subsistence. The wild plants and animals form a major food resource for the majority of the tribal and ethnic groups. These food resources contain high nutritional and medicinal value. There are several edible shoots, roots, tubers, leaves, flowers, fruits and seeds present in the forests and jungles, which are used as vegetables and are eaten in raw or cooked form.

There are many insects (Deva Nath *et al.* 2005) such as silkworms, red tree ants (*Dyrolus arientalis*), field crickets (*Cryllus* sp.), giant water bugs (*Lethocerus grandis*), termites (*Odontotermes obesus*), bees (*Apis indica*), wasps (*Vespa* sp.), water scavenger beetles (*Agabetes acuductus*), and grasshoppers which are eaten raw or boiled or fried. Insects such as water beetles, water bugs, termites, pine caterpillars, silkworm, red ants, grubs of beetle, honeybees, wasps are commonly consumed in addition to carp, snails, frogs, rats and snakes, which are abundantly available in the forests. These species provides a balanced diet with additional vitamins, minerals and protein. Several insects and animals and products made from them are used in treating various kinds of ailments by many of these communities. Jamir and Lal (2005) recorded the medicinal uses of animals and animal parts with their local and scientific names in traditional therapies amongst the Naga tribes. Meyer-Rochow (2005: 389-413) details the taxonomic identification and vernacular names of some edible insects and spiders consumed by ethnic communities of Northeast India such as the Ao Naga and the Meithei, and he compared these insects and spiders with this consumed by the communities such as the Chimbu, Onabasulu and Kiriwina of Papua New Guinea, the Walbiri

and Pintupi of Australia and the Maori of New Zealand. The cultural significance of the species used was also discussed in the comparative context. The knowledge of traditional medicines is acquired and passed on due to their intimate relationship with their ecology. Traditional and wild food sources are important as indicators of the relationship between man and his environment.

The long-term association of these people with the natural world of rich and diversified flora and fauna enabled them to develop an understanding of the medicinal properties of plants. In time, this knowledge was transformed into a belief system and a folklore relating to the medicinal remedies of certain diseases that have traditionally been cured with herbal materials. The tribal peoples have been utilising many of the plant resources for the treatment and cure of a large number of diseases for ages. A notable floral resource in the region is the variety of orchid species for which the region is often recognised to be a paradise of orchids, with the Himalayan states of Arunachal Pradesh and Sikkim having a the highest number of orchid species. The inhabitants of the Northeast use several orchid species as food, for medicinal purposes and as body ornaments (Medhi and Chakrabarti 2009: 11-16).

Filamentous fresh water red algae (Rhodophyta) are harvested for consumption by the people of Manipur, who consider it palatable due to its fishy smell, taste and flavour. These algae provide considerable amounts of carbohydrate, amino acids, carotenoids, iron and other minerals (Romeo Singh and Gupta 2011: 27-33). A great amount of ethno-medicinal plants are used in daily life by several tribes living in remote areas to fight against some very important diseases, and many of these plants are endemic to this region (Dutta and Dutta 2005). There are several recent publications which record and document the ethnobotanical uses of plants by different communities, such as the Jaintia (Sajem and Gosai 2006), the Mishing (Singh *et al.* 1996: 350-356, Hajra and Baishya 1997: 161-168) and the Karbi (Borthakur 1997: 169-178), the Yobin (Yobin 1999: 116-120), the Chakma (Sarmah *et al.* 2006: 474-484), the Nyishi and the Apatani (Rawat and Choudhury 1998), the Monpa of Arunachal Pradesh (Dam and Hajra 1997), the Garo (Vasudeva and Shampru 1997: 179-186), the Khasis and Jaintia of the Meghalaya (Kharkonger and Joseph 1997: 195-208) and the Meithei of Manipur (Huidrom Singh 1996: 364-366). A majority of the rural inhabitants of the areas in and around forest regions are dependent on medicinal plants for health care. As these medicinal plants are easily available and accessible, traditional societies exploit this economic forest resource at an optimum level, and some medicinal plants are consumed not only as a medication but also for food.

Hunting as a Livelihood

Northeast India is blessed with rich natural resources, and its tribal peoples exploit the wild animals and birds to a great extent for their livelihood. Hunting has been

a traditional practice since time immemorial. The hunted animals and birds provide a rich source of protein, and the wild meat forms a significant proportion of the annual protein intake, although hunting is not a full-time occupation. Hunting involves capturing, snaring, trapping and occasionally poisoning. The tribal hunters use the simple traditional bow and arrow, spear, various small and big traps made from bamboo and iron wire. Bows and arrows are made of bamboo and the bow string is prepared from the fibres of plant. The air and smoke gun is also used in hunting. A study conducted by Hilaluddin and Ghose (2005: 169–179) on the patterns of wild meat consumption by indigenous communities in Northeast India showed that this dependency on the forest significantly contributed to their local economy. Since the tribal peoples consume the meat of almost all species of animal, hunting is not generally aimed at any particular animal species.

Some of the commonly hunted mammals include deer, wild boar, wild goat, field rat, barking deer, sambar, takin, yak, mithun, squirrel, porcupine, gibbon and jungle cat. Some of the commonly hunted birds include jungle fowl, grey peacock pheasant and kalij pheasant. Eggs of wild birds are also frequently collected. For many of the tribes, hunting is done on a community basis at certain times. The young boys are frequently seen with a catapult or bow and arrow in their leisure time. In modern times, the over-exploitation of these animals and birds has come to present a threat to the forest resources, and today several sustainable conservation measures are being introduced by the government as well as by private agencies.

Wild animals ranging from large galliformes and hornbills to deer and primates and even elephants are hunted primarily for the consumption of their meat. However, there is also a demand for the skin, teeth, feather, beaks and other body parts which are used to adorn the traditional tribal dress of many communities. Some of the groups hunt hornbill for meat and consider the feathers to be valued ornaments or symbols of hunting prowess (Shankar Raman and Mudappa 1998: 63). Nagaland harbours a total of 487 species of birds. All these species of birds are considered edible by the tribal groups inhabiting Nagaland. These birds are frequently shot with guns, trapped with the help of crude snares or killed with a slingshot for consumption (Choudhury 2001: 94).

Many of the indigenous hill communities are avid hunters. Wild mammals and primates are hunted even inside the Dibang wildlife sanctuary of Arunachal Pradesh with guns. Additionally, traditional traps (locally called *phasi*) are used for capturing mammals and birds of various sizes. Many tribal hunters use glued sticks (Choudhury 1998). A majority of the communities adorn their houses with skins, horns, the hair and skulls of different species. Out of 25 primate species found in India, 11 species occur in the tropical and subtropical forests of the Northeast. Out of these 11 species, 9 species are currently found in Arunachal Pradesh, viz. slow loris, rhesus macaques, Assamese macaques, stump-tailed macaques, pigtail macaques, Arunachal macaques, capped langurs, western hoolock

gibbons and eastern hoolock gibbons. Some other exploited species include the leopard (*Panthera pardus*), leopard cat (*Felis bengalensis*), snow leopard (*Panthera uncial*), Indian porcupine (*Hystrix indica*), red panda (*Ailurus fulgens*), musk deer (*Moschus moschiferus*), barking deer (*Muntiacus muntjak*), wild dog (*Cuon vulpinus*), sun bear (*Helarctos malayanus*), goral (*Nemorhaedus goral*), mainland serow (*Naemohedus sumatraensis*), wild boar (*Sus scrofa*), blue sheep (*Pseudois nayaur*), serow (*Capricornis sumatraensis*), common otter (*Lutra lutra*), takin (*Budorcas taxicolor*), and large Indian civet (*Viverra zibetha*) (Chetry and Chetry 2007: 13-16).

The Daying Ering Memorial Wildlife Sanctuary, formerly known as the Lali Reserve Forest or the Lali Wildlife Sanctuary, located near Pasighat in the East Siang district of Arunachal Pradesh, is a floodplain between the Siang and Sibya rivers. The Adi community living in the periphery of the sanctuary hunt mammals and birds by setting fire to the grasslands during the dry months to flush animals and birds out of their hiding places. The Nyishi use the pelt of the hunted capped langur for covering their *dao* (a cutting tool), whilst the Adis use its skull as a painkiller by rubbing it against the affected part. Generally, various body parts of hunted game are used in different magical rituals, religious practices and traditional medicines. In Arunachal Pradesh, the Adi and other tribal communities consider hunting as a symbol of masculinity, and the hunters are glorified. A majority of the festivals observed by these communities are associated with the hunting of wild animals for meat. The prevalence of community hunting during festive occasions is also an example of the close association of these communities with their natural environment (Downstream Impact Assessment Study Report for Lower Siang Hydroelectric Project, WAPCOS Limited, 2011, http://apspcb.org.in/lower_siang_hydroelectric_project.htm, accessed on 10.07.2012).

A study conducted by Chutia (2010: 56-67) amongst the Nyishi, Monpa and Apatani tribes of Arunachal Pradesh shows that the men are exclusively involved in hunting. A total of 43 mammalian species have been hunted in their natural habitat, including carnivores, ungulates, rodents, primates, bear and *Chiropterans* and *Pholidota* by using hunting tools such as guns, mechanical traps, spears, and bows and arrows. The hunting schedule depends on the game, varying from species to species. Some of the animals are captured or killed at night. Group hunting is conducted during the months of September and October. Hunting is mostly a seasonal activity, and the maximum number of animals are caught in the winter and pre-monsoon season.

Other studies among the tribal groups in Arunachal Pradesh by Aiyadurai (2007) and Aiyadurai *et al.* (2010) reveal that hunting is done individually as well as in groups. Dogs are also used by hunters in the Seppa valley of East Kameng for chasing prey. There are several traps which are set in the forest and checked after a gap of 3 to 4 days. Poisons prepared from locally available plants are applied to

the arrow tip, which immediately kill the animal. High-altitude bamboos are used to make arrows for a special automatic trigger that releases traps and inflict a fatal wound on the target animal. Catapults are used to hunt small birds and squirrels. Several hunting strategies are followed such as hide and seek, in which the hunters wait for animals near fruit-bearing trees. Often a small platform is constructed on a tree, where the hunters lie in waiting. Imitating animal calls is another strategy by which a broken bamboo stick or leaves are used to mimic wild animal calls. The hunters use different kinds of indigenous traps such as stone traps, canopy traps, twig traps, pit fall, trigger and release traps, whereas another set of traps is used for birds. There are certain taboos regarding wild animals and birds which are observed during, before and after the hunt. Furthermore, certain taboos are observed with respect to particular species.

Although most animals are hunted for meat, certain beliefs are associated with consumption. In Mizoram, it is believed that sucking the warm blood from the throat just after killing a gibbon can cure malaria. By cutting the body of a gibbon into small pieces and tying these pieces with a thread to one's arms and ankles, one can cure ailments like gout and inflammation of the joints. Moreover, a gibbon tooth or a piece of gibbon bone worn as a talisman is considered to ward off bad omens. In the Ngengpui wildlife sanctuary area, tribal people tie the chin bone of a gibbon to their arms and legs in the belief that this accoutrement strengthens the limbs. In Mizoram, successful hunters are given the title *Tranchua* if they capture barking deer, bears, wild boar, sambar, eagles, monkeys or vipers. Another title *Pasalta* is given to the best hunter who is given the privilege of marrying the most beautiful woman in the tribe (Gupta and Sharma 2005: 104).

Animal Husbandry

Tribal groups practise animal husbandry and raise livestock (Fig. 4). Since an offering of pig, goat, mithun or fowl is an almost mandatory sacrifice at many social events, livestock is reared not just for food, but also to fulfil the needs of religious ceremonies and festive occasions. Animal husbandry forms a fundamental part of the way of life of several rural communities who rear different species of animals such as cattle, sheep, goat, yaks, pigs, poultry or rabbits for the consumption of meat or milk. Some bovines are used for ploughing and provide manure. An abundance of natural fodder resources like leaves, grass and shrubs is used for grazing. Except in the winter, ample grasslands provide grazing land, and the availability of grazing areas is a positive factor for the growth of animal husbandry in this region.

Agriculture

Agricultural practice in Northeast India is divided into two broad categories: (i) settled cultivation done in the plains, valleys, foothills and on terraced slopes, and



Figure 4: Practice of Animal Husbandry

(ii) shifting cultivation, locally known as *jhum* practiced in the hilly areas. The river valleys of the Northeast are very fertile due to frequent floods which provide natural manure due to silting. The area is conducive for agriculture, and the climate is favourable to farming. The economy relies on agriculture and its products. Table 6 lists the major crops cultivated in Northeast India. In Sikkim, there are different agro-ecosystems prevalent in accordance with the climatic and ecological conditions (Table 7).

The Forest Survey of India has recorded over 1.73 million hectares under shifting slash-and-burn a.k.a. swidden cultivation. Only a smaller area is available for settled agriculture outside the catchments of the Brahmaputra and Barak river systems. As *jhum* cultivation is the most preferred agricultural activity, swidden cultivation has evolved to be the dominant ideological paradigm in the life, culture and ethos of the hill inhabitants. However, since *jhum* has now come to pose a threat to biodiversity, several initiatives have been undertaken to protect areas from shifting cultivation and providing alternative agricultural systems in the uplands. Today there is a growing interest of shifting cultivators towards rubber plantations. In certain pockets, shifting cultivators have also begun to take up lowland paddy cultivation in the marshy lands in the foothills, where the soil has the capacity to retain moisture. Consequently, there has already been a noticeable shift of the settlements from the hilltops to the foothills in some cases.

TABLE 6: MAJOR CROPS CULTIVATED IN NORTHEAST INDIA (SOURCE: *NORTH EASTERN REGION VISION 2020*, MINISTRY OF DEVELOPMENT OF NORTHEASTERN REGION AND NORTH EASTERN COUNCIL, GOVT. OF INDIA, 2006)

<i>States</i>	<i>Major Crops</i>	<i>Plantation Crops</i>	<i>Fruits</i>	<i>Vegetables</i>	<i>Spices</i>
Arunachal Pradesh	rice, maize, millet, wheat, pulses, sugarcane	rubber, coffee, tea	bananas, apples, plum, pineapple, orange, guava, walnut, grapes	potatoes	turmeric, chillies, ginger
Assam	rice, maize, millet, wheat, pulses, coconut, sugarcane, jute, cotton, areca nut	rubber, coffee, tea	bananas, plum, pineapple, orange, papaya	sweet potatoes, cabbage, onion, tapioca	
Manipur	rice, maize, oil seeds, pulses, sugarcane, wheat	rubber, coffee	pineapple, bananas, passion fruit, lemon, orange, <i>amla</i>	cabbage, peas, brinjal, carrot, cauliflower, beans, <i>knolkhol</i> , potatoes, radish	
Meghalaya	rice, maize, jute, rapeseed, mustard	rubber	bananas, pineapple, pears, guavas, cashew	tomatoes, brinjal, potatoes, cabbage, jack fruit	chillies, ginger, turmeric
Mizoram	rice	rubber, coffee, tea	bananas, pineapple, passion fruit,		chillies, ginger
Nagaland	rice, maize, jute, rapeseed, mustard, gram, cotton, sugarcane	rubber, coffee, tea	bananas, pineapple,	jackfruit, sweet potatoes, cabbage, onion, tapioca	garlic
Sikkim	rice, maize, wheat	tea	orange, apples	potatoes	ginger
Tripura	cotton, sugarcane, rice	rubber, coffee, tea	bananas, apples, pineapple, plum, orange, guava, grapes, papaya, litchi	potatoes, tomato	

Traditional Weaving Methods

One of the interesting shared features of the indigenous ethnic groups of the Northeast is the traditional method of weaving with hemp and cotton. The varieties of handicrafts practised by the different groups have striking similarities and are mostly a woman's job. Weaving is done with a simple loin-loom made of bamboo. Weavers use various colours derived from natural dyes from plant extracts and weave traditional designs and patterns on their looms. Embroidery is done with

TABLE 7: AGRO-ECOSYSTEMS OF SIKKIM (SOURCE: *NORTH EASTERN REGION VISION 2020*, MINISTRY OF DEVELOPMENT OF NORTHEASTERN REGION AND NORTH EASTERN COUNCIL, GOVT. OF INDIA, 2006)

<i>Area</i>	<i>Climate (Altitude m)</i>	<i>Ecological adaptation</i>	<i>Crops Agriculture and horticulture</i>
Lower hills	Tropical (300 – 900 m)	Wet and dry agriculture, sedentary farming, horticulture, livestock	Rice, maize millet, wheat, pulses, oilseeds, vegetables, potato, guava, lime, lemon, mango, ginger, mandarin
Mid hill	Sub-tropical (900 – 1800 m)	Wet and dry agriculture, livestock, horticulture and minor forest produce	Rice, maize, millet, wheat, pulses, oilseeds, vegetables, potato, mandarin, plum, peach, pear, large cardamom
High hills	Temperate (1800 – 2700 m)	Dry agriculture, <i>Bhutia</i> transhumance	Maize, barley, vegetables, potato, apple, plum, peach, peas
High hills	Sub-alpine (2700 – 4000 m) Alpine (4000 – 5000 m)	Yak herding, horticulture, pastoral economy (wool, cheese, butter, hides, and potato are commercial commodities)	Mainly used for rangelands, seed potato and vegetables
Very high hills	Alpine (> 5000 m)	Yaks, sheep, horses/ ponies based trans humance. Crops grown include potato, cabbage, leafy mustard (<i>Brassica juncea</i> var. <i>regusa</i>), and radish	Mainly used for rangelands, seed potato and vegetables

porcupine needles. Traditional household weaving fulfils the requirements of each household and supports domestic economy. Womenfolk rear silkworm cocoons and then reel and spin the silk into traditional yarns. These are then woven in handlooms of a traditional nature by the back-strap method by which simple hand-carved sticks are used. All the equipment needed is made from locally available bamboo and wood.

The traditional method of weaving described in detail by Dhamija and Jain (1989: 135) is as follows:

The back-strap (loom) comprises a series of bamboo sticks which separate the continuous warp threads, thus creating the two sheds for weaving. One of the sticks is attached to the strap which attaches the warp to the body; the other end of the continuous warp is tied to a wall, a tree or two stacks driven into the ground. By pressing her feet against a piece of wood or a wall, the weaver creates the tension of the warp. A forward movement loosens the tension and enables her to lift one of the needles, thus raising alternative warp threads. The wooden beater is

inserted in between the wrap threads forming the shed through which the weft is inserted. A backward movement creates the tension. The second shed is now created by lowering the needle, moving the second bamboo closer and adding another weft thread into the shed. Since the warp is often circular, it can be pulled closer to the weaver as the weaving progresses. The warp threads are closely placed together creating a weave.

This back-strap loom is also known as a body-tension loom, which represents one of the oldest devices for weaving cloth that does not require any mechanical parts. Naga groups have their very own traditional method of weaving with the back-strap loom. In this method, the weaver's body is integral to the loom, which consists of a continuous warp stretched between two parallel pieces of bamboo. One end is tied to a post or door, and the other end is held by a strap worn around the weaver's lower back to regulate the tension with her body. In this process, first, a warp is woven according to the intended design and weaving. These warps are made on a warping frame using vertical lease sticks that keep each thread in sequence. Then, the warp is transferred to the weaver who separates it into two layers with a bamboo shed pole, lease stick and wooden rods, each serving different functions (Ranjan and Ranjan 2007: 519).

This traditional method of weaving is an age-old tradition, passed down from one generation to the other among most tribal communities (Fig. 5). Additionally,



Figure 5: Traditional Methods of Weaving

throw shuttle and fly shuttle looms are also used by some of the native ethnic groups. A study conducted among the Meithei of Manipur showed that a loin loom, locally known as *khwang iyong* is a part of each girl's dowry, and the weaving skill of a young girl is considered to be an important eligibility qualification for marriage (Pandya and Thoudam 2010). Women are supposed to weave clothes for their entire families.

Housing Technology

In terms of housing technology, we see tremendous similarities amongst the different ethnic groups (Fig. 6). The dwelling structures are dependent on local resources and influenced by environment, climate as well as culture and tastes. To minimise the effects of natural hazards such as earthquakes, heavy monsoons, floods, landslides and mudslides, which are quite common in Northeast India, several communities such as the Mishing, Karbi, Deori, Tai Phake and Bodo build their huts on a raised platform using timber or bamboo. Thatch is used for roofing. Mud mixed with cow dung is used as a tempering material for plastering the walls made of split bamboos or, otherwise, left as they are without any plaster. Ladders made of bamboo or wood are used for approaching the raised platform of the structure. The lower portion of the raised platform is used as a shelter for household animals such as goats and chickens. The holes made on the floor of the raised platform are used for passing wasted victuals to the animals kept under the structure.



Figure 6: House structures of (A) Bodo, (B) Plain Assamese, (C) Mishing and (D) Tai-Phake communities

Such houses built on raised platform, commonly known as *chang ghar* in Assamese are found in both lowland and highland areas. In the lowlands, especially the Mishing and Tai Phake make this type of house for safety reasons, since they live in the flood-prone areas of the Brahmaputra and its tributaries. On the other hand, such houses are also built in undulating or hilly landscape by communities such as the Karbi and the Naga. The people of Assam likewise make their granaries on raised platforms, which prevents the seeds from gathering moisture as well as protect them from rodents and floods in these flood-prone areas (Sharma and Hazarika *in press*).

Traditional Knowledge Systems: An Integral Part of Life

Traditional knowledge is the wisdom developed by people over many generations based on their practical knowledge for the proper utilisation and management of resources. The traditional knowledge of the surrounding ecology helps us in understanding the strategies of land use patterns. Traditional knowledge has scientific legitimacy, and Agrawal (2011: 45) writes:

Traditional Knowledge Systems are the mother of all sciences and innovation as the indigenous peoples had close ties with their environment, which was not something out there but part of their being. To eke out their livelihood they had to observe closely the local flora, fauna, rocks and minerals. Thus through trial and error and experience of millennia they developed an empirical science.

Northeast India can be regarded as repository of traditional knowledge systems which the inhabitants have accumulated regarding their environments, transmitted as knowledge passed on from their forefathers through oral traditions. Local customs and laws are in part based on such traditional knowledge. A study conducted among the Angami of Medziphema village and the Rengma of Tseminyu village in Nagaland shows that village councils play an important role in maintaining the rules and regulations related to shifting cultivation (Devi 2007). People practising *jhum* cultivation use their traditional knowledge of forest ecosystems, topography, water availability, soil nutrient status, nature and crops (Devi 2011: 250). A variety of crops like paddy, maize, yams and gourds are sown at appropriate periods. Certain folktales, rites, rituals and myths govern *jhum* activities (Ramakrishnan 1984, 1993 and 2007).

In the lowland areas of the Brahmaputra and Barak valleys, three agricultural systems of rice are followed, namely *Sali kheti*, *Ahu kheti*, and *Bao kheti*. These are practised over different seasons of the same year, showing strategic year-round cultivation in the flood zone (Hazarika 2006a, 2006b, 2011a, 2011b, 2012, 2014). Each has its own techniques and methods, depending upon the environmental and climatic conditions in which the farmer's traditional knowledge plays an important role in the selection of land, seeds, time of sowing, transplanting the seedlings, harvesting, storing and preserving seeds for the next season. The *bhoral* is the

storehouse for rice unique to Assam. Bamboo walls are plastered with mud mixed with cow dung for preservation of the rice, as the plaster maintain the grain at the same temperature in different seasons (Sharma and Hazarika *in press*). Utensils made of bamboo strips and bamboo tubes, gourd shells and pottery are used for preserving grains and seeds for the next season. Traditional techniques such drying, smoking and adding plant remains represent measures taken for storing food for hard times. Drying and storing fish is one such good example. Traditional medicines and medicinal plants are used against some very important diseases, and people in remote areas are still dependent on herbal medicines. Several plants are used in fish poisoning and others as traditional fish attractants to discourage the fish in ponds from escaping during floods.

James D. Wolfensohn, President of the World Bank, stated that ‘indigenous knowledge is an integral part of the culture and history of a local community. We need to learn from local communities to enrich the development process’ (Gorjestani 2000). The traditional knowledge systems still practised by the tribal groups of Northeast India should be documented and scientifically recorded before they pass into oblivion in this age of globalisation.

Concept of Sacred Groves

Many of the tribes observe certain taboos in conserving wild resources, as recorded in their folklore and myths. These cultural beliefs and customs reveal a deep respect for the natural world (Gupta and Guha 2002). For example, small patches of virgin forest are preserved by indigenous communities in keeping with their religious beliefs. This practice provides an example of community awareness and involvement for the conservation of natural resources through the native cultural practice in Northeast India of instituting and respecting a sacred grove.

A sacred grove is created when a patch of forest near the village is declared sacred so that it must be protected on religious and cultural grounds. The sacred grove and even individual trees or animals may be designated for preservation through this traditional practice (Khan *et al.* 2008: 281). Tripathi (2005) records as many as 79 sacred groves in the Meghalaya, owned by individuals, clans or communities, and under direct control of the clan or village councils. The religious beliefs associated with sacred groves are that certain deities reside in these forests. In this way, traditional wisdom contributes to forest protection and the conservation of biodiversity in the region. The institution of the sacred grove is common to most of the ethnic groups of Northeast India. There are certain religious practices observed by the Meithei of Manipur to propitiate forest deities such as *Lai Harouba*, a ritual celebrated in honour of the sylvan deities or *Umanglais*, who are believed to protect them from sickness, harm and natural disaster (Khumbongmayum *et al.* 2005: 1541–1582). For example, the sacred groves which go by the names of Khloo Paiu Ram Pyrthai, Urkhla, and Khloo Langdoh, located near the town of

Jowai in the Jaintia Hills, are used by the Jaintia tribe to host their annual religious festival *Beh dein khlam* (Jamir and Pandey 2003: 1498). Ialong and Raliang are other well-known sacred groves of the Jaintia Hills (Upadhaya *et al.* 2003: 584).

The sacred groves, whether they belong to an individual, a clan or the community as a whole, are traditionally managed by a religious head or by a person entrusted with the role of custodian in accordance with customary religious practice, such as the *Lyngdoh* amongst the Khasi and the *Doloi* amongst the Jaintia. The terms for sacred grove in the Jaintia, Khasi and Garo languages are *Khloo U Blai*, *Law Kyntang* and *Asong Kusi* respectively. The sacred groves of the Meghalaya are of three types such as the *Law Lyngdoh* 'forest of the priests', the *Law Niam* 'ritual forests' and the *Law kyntang* 'forests of the clan' (Syngai 1999). There are several traditional institutions that manage community forests, whereby the duty is passed on from one generation to the next (Gurdon 1987; Tiwari 2012: 18). People in Nagaland have until recently worshipped the sylvan spirits of their sacred groves by offering animals and eggs as sacrifice (Tiwari *et al.* 1998). The associated taboos and beliefs related with these groves have prevented not only the felling of trees, but even the lopping off branches, twigs and leaves or the removal of dried wood. Violating these rules is believed to provoke the presiding deity who may punish the offender (Chakrabarti 2010: 49-50). The Bodo-Koch language communities such as the Deori, Tiwa, Sonowal Kachari and Rabha live on the Brahmaputra plains rather than in the hills, but they too maintain sacred groves which they call *thaan*. In some areas, these groves are regarded to be the abode of the spirits of the ancestors, and they are accordingly used as burial groves (Barua 2009: 41).

The practice of maintaining these sacred groves is an indigenous institution which has the effect of conserving forest areas by local inhabitants. Sacred groves are also known as shrine forests, and strong cultural and traditional values are associated with them. In view of the widespread nature of the institution and the complexity of the way that this institution is embedded in the local belief systems, Chakrabarti (2010: 49) infers that this form of 'nature worship' is of hoary antiquity. As evinced by the sacred grove institution, the prudent utilisation of forest products for sustainable development has been implicitly understood by the inhabitants of the Northeast through their long and intimate association with their natural environment. Tables 8 and 9 list some taboos associated with plants and animals observed by the Meithei of Manipur (Jeetendro Singh *et al.* 2003).

Against this backdrop, it may be inferred that the Northeast has been able to maintain the richness of its biological resources until recently, in part due to the reverence and involvement of the local inhabitants in the maintenance of a reciprocal relationship between man and his environment. In recent years, due to an increase of accessibility and the demand for forest products such as timber and bamboo, considerable ecological degradation has set in throughout the Northeast in pace with growing economic development. Demographic realities and the opening up

TABLE 8: PLANTS TABOO ON SPECIFIC DAYS OR DURING SPECIFIC PERIODS (JEETENDRO SINGH *ET AL.* 2003)

<i>Name of the plant</i>	<i>Nature of taboo</i>	<i>Associated beliefs</i>
Bamboo- different species	Not harvested on Tuesday, Thursday, and Saturday, and on new moon days	-
Banana	Not harvested on Saturday	-
<i>Hatoda vasica</i>	Not harvested on Sunday	Sunday is the birthday of this plant
Almost all trees	Not felled on Friday	Gods take rest on the trees on this day
<i>Oenanthe javanica</i> (water dropwort or water parsley)	Not consumed during August-September	Violator will have worms in stomach
<i>Luffa cylindrica</i>	Not consumed by the Ningthouja clan	-
<i>Cucurbita moschata</i> (pumpkin or sweet gourd)	Not consumed by the Luwang clan	-
<i>Bombax ceiba</i> (silk cotton), <i>Portulaca</i> sp., <i>Gynura cusimba</i>	Not used or consumed by the Khuman clan	-
<i>Alpinia galanga</i> , <i>Nelumbo nucifera</i> (upto March)	Not consumed by the Khabanganba clan	-
<i>Polygonum chinensis</i> , <i>Chenopodium album</i>	Not consumed by the Angom clan	-

TABLE 9: TABOOS OBSERVED FOR FISH AND OTHER ANIMALS (JEETENDRO SINGH *ET AL.* 2003)

<i>Animal(s)</i>	<i>Nature of taboo</i>
<i>Mystus cavasius</i> (fish)	Not consumed during April-May
<i>Clarias batrachus</i> (fish)	Not consumed during May-June and December-January
<i>Osteobrama cotio</i> (fish)	Not consumed during June-July
<i>Bagarius yerrelli</i> (fish)	Not consumed during July-August
<i>Botia</i> spp. (fish), crabs	Not consumed during August-September
<i>Macronacthus aral</i> (fish), ducks	Not consumed during September-October
<i>Wallago attu</i> (fish)	Not consumed during October-November
<i>Monoptera</i> spp. (fish)	Not consumed during November-December
<i>Esomus donricus</i> (fish)	Not consumed during January-February
<i>Puntius</i> spp. (fish), turtles and tortoises	Not consumed during February-March
<i>Lepidocephalus berdmorei</i> , <i>Labeo rohita</i> (fish)	Not consumed during March-April
Turtles and tortoises, <i>Brotia costula</i> (snail), <i>Macrognaathus</i> spp., <i>Bagarius</i> spp. (fish)	Not consumed by the Ningthouja clan
<i>Brotia costula</i> (snail), <i>Macrognaathus</i> spp., <i>Bagarius</i> spp., <i>Channa morulius</i> , <i>Mastacembalus</i> spp., (fish), egg and meat of many animals	Not consumed by the Khuman clan
Field rats	Not consumed by the Khabanganba clan
<i>Passer domesticus</i> (Sparrow)	Not consumed by the Moirang clan
Frogs	Not consumed by Meithei, as it prevents entry to heaven

contd. table 9

<i>Animal(s)</i>	<i>Nature of taboo</i>
All animals	Not consumed during their mating season(s)
All animals	Not consumed by pregnant women
All animals including fish	Not consumed for 12 days after the death of a family member
All animals including fish	Not consumed on the day of the death every month for one year
All animals including fish	Not consumed on the death anniversary
All animals including fish	Not consumed on the Meithei New Year Day by some clans

of the Northeast have destroyed the sacred relationship between man and his environment utmost.

Concluding Remarks

To sum up some of our major observations, which we have examined in this paper in detail, the tribal populations of Northeast India are primarily agriculturalists and occasional hunter-gatherers. Wild animals and birds are hunted for food, medicine and used in rituals. Their subsistence economy is based on *jhum* cultivation, horticulture, raising livestock, foraging wild plants and hunting. These ethnic groups still live in remote areas and practise simple subsistence and settlement strategies with limited technological advancement. Bamboo is a versatile multi-purpose forest product which has been continuously exploited by the people of this region throughout the ages. The indigenous tribal groups are dependent on bamboo for various activities, domestic as well as agricultural and in hunting and gathering. The dependence on the natural world is amply manifest in the indigenous lifestyle and in native social customs and cultural traditions.

The exploitation of the natural environment through sustainable utilisation of the resources which the ecosystem affords is in keeping with the body of traditional knowledge accumulated over generations. The taboos and customary laws regarding the exploitation of natural resources show their respect towards nature. The institutions of sacred groves, which are believed to be the residence of forest deities, indicate the involvement of the community in sustainable exploitation through the traditional laws regarding the prohibition on the use of certain resources. Such practices appear to be of great antiquity. Despite the ethno-linguistic diversity of the region, a unique spirit of harmony is shared amongst the native peoples. The Northeast has until recently remained beyond or largely at the fringe of globalisation and so still represents one of the least explored regions of India.

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